

LED Manufacturing Process Modifications Will Boost Quality and Cut Costs

January 2012

Fact Sheet

The Issue

Highly energy-efficient Light-Emitting Diode (LED) lighting products have made great strides in improving how well a source produces visible light since their introduction to the market, but LED manufacturing techniques are still costly and often yield products that have performance issues related to color balance and brightness. These factors inhibit the widespread adoption of LEDs to meet lighting needs. Currently, the basic building block to produce LED lighting products is the Gallium Nitride semiconductor material, which is produced via a layering process known as metallo-organic chemical vapor deposition. This current LED layering process was designed and built primarily for research and development rather than true volume manufacturing.

Project Description

Researchers will develop an advanced layering technique that will cut manufacturing costs and increase “quantum efficiency” – the efficiency of the process by which LEDs convert electricity to light. The new process, known as hydride vapor phase epitaxy, is expected to minimize the number of defects in semiconductor layers – resulting in faster per-unit production cycle time, increased throughput (yield), reduced use of chemicals for fabrication, improved product wavelength uniformity and output power, and minimal manufacturing waste.



LED manufacturing process equipment
Source: Applied Materials, Inc.

Anticipated Benefits for California

The project objective is to develop a production process that will enable LED manufacturers to produce higher quality, energy-efficient products at lower costs to consumers.

A successful project will help lead to wider market adoption of an LED lighting technology that is estimated to have the potential to reduce lighting energy use in California by up to 20 percent or greater for many applications. A successful outcome from the described research will expand the energy savings potential of this emerging technology.

Project Specifics

Grant Agreement Number: PIR-10-055

Recipient: Applied Materials, Inc.

City/County: Santa Clara/Santa Clara County

Application: Marketwide

California Energy Commission cofunding: \$500,000

Cofunding: Applied Materials received \$3.99 million via a 2010 American Recovery and Reinvestment Act Award from the U.S. Department of Energy and is investing \$3.6 million of its own funds in the project.

Term: April 2011 to July 2012

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CEC-500-2012-FS-004